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PTO/SB/05 (4/98)
Approved for use through 09/30/2000. OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	74047
First Inventor or Application Identifier	Bruce A. Scheffer
Title	METHOD AND APPARATUS FOR EFFECTING SHINGLING OF CONVEYED PRINTED PRODUCTS
Express Mail Label No.	EM509547849US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231**

1. [X] * Fee Transmittal Form *(e.g., PTO/SB/17)* *(Submit an original and a duplicate for fee processing)*
2. [X] Specification [*Total Pages* 21]
   (preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 U.S.C. 113)* [*Total Sheets* 5]
4. Oath or Declaration [*Total Pages* 3]
   a. [ ] Newly executed (original or copy)
   b. [X] Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 16 completed)*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

**NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).*

5. [ ] Microfiche Computer Program *(Appendix)*
6. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. [ ] Assignment Papers (cover sheet & document(s))
8. [ ] 37 C.F.R.§3.73(b) Statement *(when there is an assignee)* [X] Power of Attorney
9. [ ] English Translation Document *(if applicable)*
10. [X] Information Disclosure Statement (IDS)/PTO-1449 [X] Copies of IDS Citations
11. [X] Preliminary Amendment
12. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
13. [ ] * Small Entity Statement(s) *(PTO/SB/09-12)* [X] Statement filed in prior application, Status still proper and desired
14. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
15. [X] Other: Petition to Make Special

16. **If a CONTINUING APPLICATION,** *check appropriate box, and supply the requisite information below and in a preliminary amendment:*
    [ ] Continuation [X] Divisional [ ] Continuation-in-part (CIP) of prior application No: 08 / 496,822
    Prior application information: *Examiner* Charles Goodman *Group / Art Unit:* 3724
    For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

[ ] *Customer Number or Bar Code Label* *(Insert Customer No. or Attach bar code label here)* *or* [X] *Correspondence address below*

Name	Richard L. Wood, Esq.				
Address	Welsh & Katz, Ltd. 120 S. Riverside Plaza - 22nd Floor				
City	Chicago	*State*	IL	*Zip Code*	60606
Country		*Telephone*	(312) 655-1500	*Fax*	(312) 655-1501

Name (Print/Type)	Richard L. Wood, Esq.	*Registration No. (Attorney/Agent)*	22,839
Signature	Richard L. Wood	*Date*	9/25/98

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

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FEE TRANSMITTAL

Note: Effective October 1, 1997.
Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT ($) 730.00

Complete if Known	
Application Number	
Filing Date	Sep. 25, 1998
First Named Inventor	Bruce A. Scheffer
Group Art Unit	3724
Examiner Name	Charles Goodman
Attorney Docket Number	74047

METHOD OF PAYMENT (check one)

1. [X] The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number: 23-0920
Deposit Account Name: Welsh & Katz, Ltd.

[X] Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17
[ ] Charge the Issue Fee Set in 37 CFR 1.18 at the Mailing of the Notice of Allowance

2. [X] Payment Enclosed:
[X] Check [ ] Money Order [ ] Other

FEE CALCULATION

1. FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	790	201	395	Utility filing fee	395.00
106	330	206	165	Design filing fee	
107	540	207	270	Plant filing fee	
108	790	208	395	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 395.00

2. CLAIMS

		Extra		Fee from below		Fee Paid
Total Claims	17	-20 = 0	X		=	
Independent Claims	8	- 3 = 5	X		=	205.00
Multiple Dependent Claims		0	X		=	0

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	22	203	11	Claims in excess of 20
102	82	202	41	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim
109	82	209	41	Reissue independent claims over original patent
110	22	210	11	Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 205.00

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	0
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	0
139	130	139	130	Non-English specification	0
147	2,520	147	2,520	For filing a request for reexamination	0
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	0
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	0
115	110	215	55	Extension for reply within first month	0
116	400	216	200	Extension for reply within second month	0
117	950	217	475	Extension for reply within third month	0
118	1,510	218	755	Extension for reply within fourth month	0
128	2,060	228	1,030	Extension for reply within fifth month	0
119	310	219	155	Notice of Appeal	0
120	310	220	155	Filing a brief in support of an appeal	0
121	270	221	135	Request for oral hearing	0
138	1,510	138	1,510	Petition to institute a public use proceeding	0
140	110	240	55	Petition to revive - unavoidable	0
141	1,320	241	660	Petition to revive - unintentional	0
142	1,320	242	660	Utility issue fee (or reissue)	0
143	450	243	225	Design issue fee	0
144	670	244	335	Plant issue fee	0
122	130	122	130	Petitions to the Commissioner	130.00
123	50	123	50	Petitions related to provisional applications	0
126	240	126	240	Submission of Information Disclosure Stmt	0
581	40	581	40	Recording each patent assignment per property (times number of properties)	0
146	790	246	395	Filing a submission after final rejection (37 CFR 1.129(a))	0
149	790	249	395	For each additional invention to be examined (37 CFR 1.129(b))	0
				Other fee (specify) _____	0
				Other fee (specify) _____	0

* Reduced by Basic Filing Fee Paid

SUBTOTAL(3) ($) 130.00

SUBMITTED BY				Complete (if applicable)	
Typed or Printed Name	Richard L. Wood, Esq.			Reg. Number	22839
Signature	Richard L Wood	Date	9/25/98	Deposit Account User ID	

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231 DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Bruce A. Scheffer et al.

Group No.: 3724

Serial No.:

Examiner: Charles Goodman

Filed: September 25, 1998

For: METHOD AND APPARATUS FOR EFFECTING SHINGLING OF CONVEYED PRINTED PRODUCTS

I hereby certify that this paper is being Deposited with the United States Postal Service as Express Mail in an envelope addressed to: **Assistant Commissioner for Patents, Washington, DC 20231**, on this date:

9/25/98 Donald Glenn
Date

Express Mail No.
EM509547849US

Attorney Docket No.: 74047

PETITION TO MAKE SPECIAL UNDER 37 C.F.R. § 1.102(d)

Box PATENT APPLICATION
Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Applicants through their undersigned attorneys, hereby petition pursuant to 37 C.F.R. § 1.102(d) and MPEP § 108.02 (VIII) to make their above-identified divisional application, which is being filed simultaneously herewith, special.

A check in the amount of $130.00 is enclosed to cover the Petition fee under 37 C.F.R. § 1.17(i) to make this application special. The Commissioner is hereby authorized to charge any additional fees which may be required, should the enclosed check be in the wrong amount or entirely missing or otherwise improper, or credit any overpayment, to Deposit Account No. 23-0920.

The claims as filed in the subject divisional application by way of a Preliminary Amendment are believed to be directed to a single invention. If the Office determines that all of the claims in the application are not directed to a single invention, applicants will make an election

without traverse as a prerequisite to the grant of special status.

Applicants submit that a pre-examination search in the PTO was made by applicants' undersigned attorney in Class 271, subclasses 182, 202 and 204, including the related foreign art located in the Examining Group search room. A later second patentability search was conducted in the PTO by applicants' undersigned attorney in Class 271, subclasses 182, 202 and 204, directed specifically to the subject matter defined in claims 7-22 set forth in applicants' Preliminary Amendment being filed in the subject divisional application. Prior art has also been cited by the PTO during prosecution of applicants' parent application

* * * *

Enclosed herewith are copies of the following listed patents that are presently known and believed to be most pertinent to the subject matter encompassed by applicants' claims 7-22. The listed patents are also identified in an Information Disclosure Statement (IDS) under 37 C.F.R. §§ 1.56, 1.98 and 1.99 that accompanies this Petition. Duplicate copies of the listed patents are not included with the IDS.

U.S. Patent No.	Issue Date	Inventor(s)
3,178,174	Apr. 13, 1965	Schneider
3,994,221	Nov. 30, 1976	Littleton
4,040,617	Aug. 9, 1977	Walkington
4,966,521	Oct. 30, 1990	Frye et al.
4,969,640	Nov. 13, 1990	Littleton
5,039,082	Aug. 13, 1991	Littleton
5,060,928	Oct. 29, 1991	Vits

U.S. Patent No.	Issue Date	Inventor(s)
5,143,368	Sep. 1, 1992	Kiyota et al.
5,249,791	Oct. 5, 1993	Belanger et al.
5,366,217	Nov. 22, 1994	Tokuno et al.
5,607,148	Mar. 4, 1997	Mack et al.

Detailed Discussion of the Prior Art Patents

U.S. Patent No. 4,966,521 (Frye et al.) discloses a tail stopping and knockdown device that uses a "tail-stopping device" comprising a top roll brush 24 and a slowly rotating roll 26. The roll 24 has brush members 32, 34 operative to engage the tail end of each successive sheet so as to exert sufficient pressure on an underlying sheet against the roll to cause the lower sheet to move into the stacking pile while the top sheet continues to sit on the unnipped-slow speed roll 26 waiting for the next nip of the brush member (Col. 2, line 52, to Col. 3, line 10).

U.S. Patent No. 4,969,640 (Littleton) discloses a sheet diverting system employing snubbing means for decelerating successive conveyed sheet products to facilitate overlapping or shingling of successive sheet products. The embodiments of FIGS. 9-11 employ a pair of "snubber arks" 125A, 127A fixed to a snubber shaft 131 (Col. 15, lines 54-65). The snubber support shaft 131 is driven at a ratio of 1 to 1 with respect to rotation of the rotary knife cylinder 19 (Col. 13, lines 60-63). Rotation of the snubber shaft is effective so that the snubber members depress incoming sheets against the low speed conveyor while the tail end of the next successive sheet is trapped between or has just immediately left the high speed conveyor belts 53 and 75 (Col. 14, lines 4-43).

U.S. Patent No. 3,994,221 (Littleton) discloses a sheeter that utilizes a knock-down arm 90 rotatably driven at a 1 to 1 ratio with the cutting cylinder so that the knock-down arm rotates once for each rotation of the cutting cylinder and acts once upon each sheet being fed through the machine. Means are provided for phasing the knock-down arm 90 so that it operates upon the tail end of each sheet being fed into the slow speed conveyor belt 50 (Col. 4, lines 27-41).

U.S. Patent No. 5,143,368 (Kiyota et al.) discloses a paper dodging device having a pair of upper and lower high-speed belts for feeding paper onto a low-speed belt with the upper high-speed belt being overlapped above the inlet side of the low-speed belt. A snubber 11 is disposed above the inlet side of the low-speed belt and has an outer diameter gradually increasing toward the rear side with respect to the rotational direction of the snubber so as to form paper dropping portions at the outer peripheral end of each increasing diameter for peeling the rear end of paper from the upper high-speed belt.

U.S. Patent No. 5,366,217 (Tokuno et al.) discloses a sheet stacker wherein sheets cut by a sheet cutter are conveyed into a stacking station by a conveyor with a fixed sheet interval. A pair of clamping devices 14a and 14b are operative to clamp the tail ends of cut sheets by means of rotating devices 32a having free rolls 30a that press the tail ends of cut sheets against a slowdown roll 28a, in the case of clamping device 14a, to equalize the speed of a cut sheet to the speed of the slowdown roll 28a. The clamping device 14b clamps the tail ends of cut sheets against a slowdown roll 28b to slow down each sheet to an optimum speed and send out the sheet to a second stacking zone 16b. This patent describes as prior art the device of FIG. 8 that employs a brush roll 103 having brushes 108 operative to press the tail ends of sheets against a low speed roll 104.

U.S. Patent No. 5,060,928 (Vits) discloses an apparatus for depositing sheets at a stacking station and having means for reducing the conveying speed of the sheets. The apparatus includes

two similar deflecting members 30, 31 that are spaced apart in the conveying direction and act, respectively, on a braking member 32 and a conveying member 33 arranged underneath the conveying plane. The deflecting members 30 and 31 consist of disks 36, 37, respectively, that are spaced apart on driven shafts 34, 35 and are fitted with segment-like brushes 38, 39, respectively. The brush 38 serves to press the end of a sheet 42 against the cylindrical jacket 41 to retard the speed of the sheet.

U.S. Patent No. 5,249,791 (Belanger et al.) discloses a fan delivery unit wherein a plurality of fan disks are arranged next to one another on a rotor shaft and have fan blades forming fan pockets therebetween. A device for braking printed products as they are fed into the fan pockets is provided that employs a plurality of brake rollers corresponding in number to the fan disks and which, in the embodiment illustrated in FIGS. 1-3b, employ brush segments 19a and 19b fastened onto brake rollers 18 so as to engage the trailing ends of printed products 30 for effecting braking as they enter the fan pockets.

U.S. Patent No. 5,607,148 (Mack et al.) discloses a device for removing copies diverted from a conveyed stream thereof and employs a rotating copy brake 15 having what appear to be brush type members operative to press copies 36 against suction tapes 16 decelerate movement of the copies 36 to be delivered into a main pile 19. A second upper copy brake 22 operates in a similar manner.

U.S. Patent No. 3,178,174 (Schneider) discloses an apparatus for overlapping sheets that, in the embodiment illustrated in FIGS. 5-7, employs a press-down component 19 which is driven by a rotating cross cutting means 3 so that the member 19 presses the rearward ends of sheets against underlying break bands 20.

U.S. Patent No. 4,040,617 (Walkington) discloses a sheet feeding apparatus wherein sheets fed between fast and slow conveyors have their trailing ends engaged by a dabber roller 15 that is rotated in synchronized relation with the sheet delivery on the high-speed conveyor so that the resiliently mounted rolling element nips the trailing portion of each sheet to the upstream roll of the slower speed conveyor and travels with the sheet, maintaining the nip, over and arch of rotation of the roller.

U.S. Patent No. 5,039,082 (Littleton) discloses an apparatus for decelerating and shingling a stream of regularly spaced apart sheets in a sheet processing system. Each sheet is subjected to a first plurality of snubber assemblies 123 each of which includes a snubber arch 125 operative to engage each sheet S substantially near its tail, thereby pressing the sheet onto an underlying slower speed conveyor belt to effect deceleration. The snubber arches 125 are rotated at approximately the same speed as the underlying belts 121. A deck plate 201 may be provided below the snubber to provide a solid platform against which the snubber arches 125 can trap the respective sheets S. A second deceleration and shingling system 220 is provided downstream from the snubbing means 123 to further decelerate each sheet S by means of a pair of snubber wheels 225 and 227 freely rotatable on snubber support plates 224. The snubber wheels 225 or 227 engage the tail end of an incoming sheet so as to press the sheet against the lower speed belts 229 thereby further decelerating the sheet.

None of the above- discussed patents teach or suggest a method or apparatus for shingling successive irregularly spaced sheet products cut by a rotary cutter from a continuous web of sheet material and wherein the irregularly spaced sheet products are caused to shingle as they pass from a first conveyor to a second slower speed conveyor by at least one knock-down wheel having a number of knock-down elements corresponding to the number of cutter knives on the rotary cutter

that establish the trailing edges of the irregularly spaced sheet products, the knock-down elements being angularly spaced about the knock-down wheel to correspond to the angular positions of the trailing edge cutting knife blades on the cutter and being rotated in phase relation with the cutter so that the tangential velocity of the outer ends of the knock-down elements is substantially equal to the tangential velocity of the cutting edges of the cutter knife blades, and the knock-down elements engage the trailing edges of the irregularly spaced products at substantially the same position relative to their trailing edges.

It is believed applicants' claims as presented in their accompanying divisional application patentably distinguish over the above discussed prior patents known to applicants, and expedited examination of applicants' divisional application is earnestly solicited.

Respectfully submitted,

WELSH & KATZ, LTD.

By Richard L. Wood

Richard L. Wood
Reg. No. 22,839

September 25, 1998
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Bruce A. Scheffer et al.

Group No.: 3724

Serial No.:

Examiner: Charles Goodman

Filed: September 25, 1998

For: METHOD AND APPARATUS FOR EFFECTING SHINGLING OF CONVEYED PRINTED PRODUCTS

Attorney Docket No.: 74047

I hereby certify that this paper is being Deposited with the United States Postal Service as Express Mail in an envelope addressed to: **Assistant Commissioner for Patents, Washington, DC 20231**, on this date:

9/25/98
Date

Express Mail No.
EM509547849US

PRELIMINARY AMENDMENT

Box PATENT APPLICATION
Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Applicants through their undersigned attorneys, amend their above-identified divisional application as follows:

In the Specification:

Page 4, line 10, change "of" to --having--; delete "length" and insert --gaps between successive products--;

Same page, line 29, before "printed" insert --irregularly spaced--.

Page 5, line 1, before "printed" insert --irregularly spaced--.

Page 6, line 6, before "printed" insert --irregularly spaced--;

Same page 6, line 14, change "member" to --number--;

Same page, line 15, before "printed" insert --irregularly spaced--;

Same page, line 21, change "gaps" to --gap--;

Same page, line 35, delete "printing plate" and insert --knife-- therefor.

Page 8, line 20, after "of" insert --a modified embodiment of--.

Page 9, line 10, delete "comparing the manner of";

Same page, line 12, change "mace" to --made--.

Page 10, line 3, delete "As schematically illustrated in FIG. 10," and change "the" to --The--;

Same page, line 18, delete "the web" and insert --each press repeat--;

Same page, line 23, after "printer" add --, such as represented by printed products 26a-e of a first repeat length of web, and printed products 26'a and 26'b at the leading end of a second repeat length of the web--;

Same page, line 32, change "printer" to --cutter--.

Same page, line 10, delete "are rotatable in timed relation to the anvil cylinder 16 and";

Same page, line 12, after "cylinder" (second usage) insert --in a known manner--.

Page 12, line 4, change "pulley" to --roller--;

Same page, line 8, after "about" insert --a--; and change "pulleys" to --roller--;

Same page, line 9, after "and" insert --a roller--;

Same page, line 10, change "a" to --the--;

Same page, line 23, change "belts" to --belt--, insert a period (.) after "72", and delete "which preferably conform in number to the high speed";

Same page, line 24, delete "conveyor belts 54. Each of"; change "the" to --The--; and change "belts" (second usage) to --belt--;

Same page, line 25, change "pulley" to --roller--;

Same page, line 26, change "pulley" to --roller--;

Same page, line 30, after "idler" change "rollers to --roller--, and after "drive" change "rollers 74" to --roller 76--;

Same page, line 31, change "belts" to --belt--;

Same page, line 32, change "motor" to --roller--;

Same page, line 33, change "or" to --controlled--.

Page 13, line 1, change "pulleys" to --roller--; and change "are" to --is--;

Same page, line 4, change "belts" to --belt--;

Same page, lines 11, 12 and 13, change "rollers" to --roller--;

Same page, line 25, change "rollers" (second usage) to --roller--;

Same page, line 27, change "surfaces" to --surface--;

Same page, line 28, change "reaches" to --reach--;

Same page, line 33, change "rollers" to --roller--.

Page 14, line 19, change "blade" to --blades--;

Same page, line 36, delete "printing plate cylinder with which" and insert --circular path traversed by the outer cutting edges of the knife blades carried on-- therefor; delete "and";

Same page, line 37, delete "delivery system 10 are used".

Page 15, line 34, change "a" to --as--.

Page 16, line 24, delete "bracket" and insert --pair of brackets 132a and 132b which are mounted on a plate-- therefor.

Page 21, In the Abstract, line 1, change "an" (second usage) to --and--.

In the Claims:

Cancel claim 1 after granting a filing date to the subject divisional application.

Cancel claims 2-6 without prejudice.

Add claims 7-22 as follows:

7. Apparatus for shingling successive sheet products cut from a substantially continuous web of sheet material, said apparatus comprising, in combination, a variable rotary cutter having a plurality of knife blades having cutting edges operative to cut the web generally transversely into irregularly spaced sheet products of substantially equal longitudinal lengths having leading and trailing edges, first conveyor means for receiving said sheet products in successive fashion from said rotary cutter and defining a first conveyor path along which said successive sheet products are conveyed in irregularly spaced relation at a first longitudinal speed, second conveyor means having an upstream end for receiving said sheet products in successive fashion from said first conveyor means and defining a second conveyor path along which said sheet products are conveyed at a slower longitudinal speed than said first longitudinal speed, knockdown means including at least one rotary knockdown wheel spaced above and generally adjacent said upstream end of said second conveyor means, said knockdown wheel having a plurality of knockdown members adjustable about an outer periphery of said wheel, said knockdown members being equal in number to the number of knife blades on said rotary cutter that establish said trailing edges of said irregularly spaced sheet products and being positioned about the outer periphery of said wheel so that outer surfaces of said knockdown members are operative to engage and depress successive sheet products generally adjacent their trailing edges as said irregularly spaced sheet products pass from said first to said second conveyor means whereby to enable shingling of successive sheet products, and means for rotating said knockdown wheel so that said outer surfaces

of said knockdown members have a tangential velocity substantially equal to the tangential velocity of said knife cutting edges during operation of said apparatus.

8. Apparatus as defined in claim 7 wherein said knockdown wheel has a center axis of rotation, said knockdown members being disposed in generally radial relation to said center axis.

9. Apparatus as defined in claim 8 wherein said knockdown members lie substantially in a common plane transverse to said axis of rotation of said knockdown wheel.

10. Apparatus as defined in claim 8 wherein said knockdown members include brush bristles defining said outer surfaces thereof.

11. Apparatus as defined in claim 7 including brake means for engaging an undersurface of the trailing edge of each successive sheet product as it is engaged by a knockdown member so as to assist in decelerating each said sheet product as it enters said second conveyor means.

12. Apparatus as defined in claim 7 including means for varying the rotational phase relation between said rotary cutter and said knockdown wheel so as to vary the point of engagement of said knockdown members with said sheet products relative to the trailing edges of said sheet products.

13. Apparatus as defined in claim 12 wherein said means for varying said rotational phase relation comprises a harmonic drive operatively associated with said rotary cutter and said knockdown wheel.

14. Apparatus as defined in claim 12 wherein said means for varying said rotational phase relation comprises a differential gear drive operatively associated with said rotary cutter and said knockdown wheel.

15. Apparatus as defined in claim 7 including headstop means operatively associated with said second conveyor means so as to engage a leading edge of each successive printed product and effect deceleration thereof as said product passes to said second conveyor means, said headstop means being positioned to be engaged by the leading edge of a printed product when the trailing edge of said product is adjacent the upstream and of said second conveyor means.

16. A system for producing printed sheet products, comprising, in combination, a rotary print cylinder operative to produce a plurality of printed products on a continuous length longitudinally moving web during each repeat of the print cylinder, a variable rotary knife cylinder downstream from said print cylinder and operative to sever the web generally transversely so as to create individual irregularly spaced printed products having leading and trailing edges, a first conveyor operative to receive said individual irregularly spaced printed products from said knife cylinder and convey said printed products at a first speed, a second conveyor operative to receive said irregularly spaced printed products from said first conveyor and convey said products at a slower speed than said first speed, headstop means operatively associated with said second conveyor for cooperation with each successive printed product to momentarily decelerate movement of each said successive printed product received from said first conveyor when the trailing edge of each said printed product is adjacent an upstream end of said second conveyor, and at least one knockdown wheel supported adjacent said upstream end of said second conveyor, said knockdown wheel having a plurality of kicker members disposed about its periphery equal to, or a whole integer multiple of, the number of printed products created by said print cylinder during each repeat revolution thereof, said knockdown wheel being positioned and rotated so that each kicker member engages the trailing edge of a printed product when the leading edge of said printed product engages said headstop means to facilitate shingling of successive printed products passing

from said first to said second conveyor.

17. In a delivery system for receiving a printed web from a rotary print cylinder operative to print a plurality of equal length irregularly spaced printed products on each repeat length of the web, said system further including a variable rotary knife cylinder having a plurality of knife blades thereon positioned to sever each said repeat length of web so as to create irregularly spaced individual equal length printed products having leading and trailing edges, a first conveyor for conveying said individual printed products from said knife cylinder along a predetermined path at a first speed, and a second conveyor having an upstream end adapted to receive said printed products from said first conveyor and convey said products at a speed less than said first speed; the combination therewith comprising at least one knockdown wheel having a generally circular periphery and a center axis of rotation, said knockdown wheel having a plurality of knockdown elements supported about said periphery equal in number to the number of knife blades on said knife cylinder that establish said trailing edges of said printed products severed from said web, said knockdown wheel enabling adjustable positioning of said knockdown elements about said periphery in angular circumferential positions corresponding to the angular circumferential positions of said knife blades that establish said trailing edges, and means for supporting said knockdown wheel adjacent said upstream end of said second conveyor for rotation about said center axis in rotational phase relation to rotation of said knife cylinder such that said knockdown elements depress each successive printed product generally adjacent its trailing edge as said irregularly spaced printed products pass from said first to said second conveyor.

18. The system as defined in claim 17 including at least one headstop roller cooperative with said second conveyor to define a nip operative to receive the leading edge of each successive printed product passing from said first to said second conveyor, said nip being operative to reduce

the speed of each successive printed product entering said nip when the trailing edge of said printed product underlies said knockdown wheel preparatory to being engaged by one of said knockdown elements.

19. Apparatus for making a plurality of printed products from a continuous web comprising, in combination, a rotary print cylinder, means for effecting cooperation between the web and said print cylinder so as to create a plurality of generally equal length printed products on a repeat length of the web during each rotational repeat of said print cylinder and wherein the printed products are irregularly spaced between a leading edge and a trailing edge of each repeat length of web, a rotary cutter having knife blades thereon, means for effecting cooperation between said repeat length of web and said variable rotary cutter so that said knife blades sever the web and create discrete irregularly spaced equal length printed products having leading and trailing edges, first conveyor means for conveying the severed irregularly spaced printed products from said rotary cutter along a first conveyor path at a first speed, second conveyor means for conveying the severed irregularly spaced printed products from said first conveyor path along a second conveyor path at a second speed less than said first speed, said second conveyor path having an upstream end positioned to receive said severed irregularly spaced printed products from said first conveyor path, and at least one knockdown wheel having an axis of rotation and a generally circular periphery and having a plurality of knockdown elements adjustable about said periphery, said knockdown elements being equal in number and positioned at substantially corresponding angular positions about said axis of rotation as are said knife blades on said rotary cutter that create said trailing edges of said printed products severed from said repeat length of said web, said knockdown wheel being positioned generally adjacent said upstream end of said second conveyor path so that effecting rotation of said wheel about said axis of rotation in predetermined phase relation to said rotary

cutter causes said knockdown elements to each engage a discrete printed product received from said first conveyor path generally adjacent its trailing edge to enable the leading edge of each successive printed product received from said first conveyor path to pass over the trailing edge of the preceding printed product in shingled fashion.

20. In apparatus for conveying irregularly spaced printed products from a first conveyor to a second conveyor traveling at a slower speed than the first conveyor, and wherein said printed products have leading and trailing edges and are formed by a rotary cutter from predetermined equal lengths of a continuous web so that each predetermined length of web has an equal number of irregularly spaced equal length printed products formed therefrom; the improvement comprising a knockdown wheel supported adjacent an upstream end of the second conveyor and operative to engage the trailing edge of each successive printed product as it is conveyed from said first to said second conveyor, said knockdown wheel having an axis of rotation and a substantially circular periphery, and a plurality of knockdown elements mounted on said periphery so as to enable selective angular adjustment of said knockdown elements about said axis of rotation, said knockdown elements being equal in number to the number of said printed products formed from each said predetermined length of web and being positioned so that upon rotating said knockdown wheel in predetermined phase relation to said rotary cutter, said knockdown elements engage said trailing edges of said irregularly spaced products conveyed from said first to said second conveyor.

21. A method for making a plurality of printed products from a continuous web, comprising the steps of:

effecting cooperation between the web and a rotatable print cylinder so as to create a plurality of generally equal length printed products on a repeat length of the web during each rotational repeat of said print cylinder and wherein the printed products are irregularly spaced

between a leading edge and a trailing edge of each repeat length of web,

effecting cooperation between said repeat length of web and a variable rotary cutter having knife blades operative to sever the web so as to create discrete generally equal length irregularly spaced printed products having leading and trailing edges,

conveying the severed irregularly spaced printed products from said rotary cutter along a first conveyor path at a first speed,

conveying the severed irregularly spaced printed products from said first conveyor path along a second conveyor path at a second speed less than said first speed, said second conveyor path having an upstream end positioned to receive said severed printed products from said first conveyor path,

providing at least one knockdown wheel having a center axis and a generally circular periphery and having a plurality of knockdown elements adjustable about said periphery to correspond in number and angular relation to said knife blades on said rotary cutter that create said trailing edges of said irregularly spaced printed products severed from a repeat length of said web, and

positioning said knockdown wheel generally adjacent said upstream end of said second conveyor path and effecting rotation of said wheel about said center axis so that each of said knockdown elements engages a discrete printed product received from said first conveyor path generally adjacent its trailing edge so as to enable the leading edge of each successive printed product received from said first conveyor path to pass over the trailing edge of the preceding printed product in shingled fashion.

22. A method for shingling printed products made from a continuous web having printed products formed thereon by a rotary print cylinder so that, for a repeat length of the web

having a leading end and a trailing end, a plurality of equal length printed products are irregularly spaced along said repeat length to create a waste strip at either said leading or trailing end thereof, said method comprising the steps of:

effecting cooperation between said repeat length of web and a rotary cutter having knife blades operative to sever the web and create discrete equal length, irregularly spaced printed products having leading and trailing edges,

conveying said discrete irregularly spaced products from said rotary cutter along a first conveyor path at a first speed to a second conveyor path operative to convey said products at a second speed less than said first speed, said second conveyor path having an upstream end positioned to receive said products from said first conveyor path,

providing at least one rotatable knockdown wheel having a plurality of knockdown elements adjustable about a rotational axis of said wheel so that said knockdown elements correspond in number and angular relation about said rotational axis to said knife blades on said rotary cutter that create said trailing edges of said printed products, and

positioning said knockdown wheel generally adjacent said upstream end of said second conveyor path and effecting rotation of said wheel so that each of said knockdown elements momentarily engages a discrete printed product adjacent its trailing edge as said product is received from said first conveyor path to enable the leading edge of the next successive printed product received from said first conveyor path to pass over said momentarily engaged trailing edge in shingled fashion.

This Preliminary Amendment accompanies a Petition to Make Special Under 37 C.F.R. § 1.102(d) that encloses prior patents known to applicants' and that may be material to examination of above claims 7-22. The prior patents comprise applicants' Information Disclosure Statement Under

37 C.F.R. 1.56, 1.98 and 1.99, and a Form PTO-1449 is enclosed with the Petition to make Special.

Applicants' claims 7-22 as presented herein are believed to be allowable over the prior art known to applicants, and their allowance is earnestly solicited.

Respectfully submitted,

WELSH & KATZ, LTD.

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PATENT
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DECELERATING MECHANISM FOR PRINTED PRODUCTS

Background of the Invention

The present invention relates generally to apparatus for controlling shingling of printed products conveyed in sequential order from a rotary printing press and variable rotary cutter to a stacking or handling station, and more particularly to novel mechanism for effecting improved deceleration and shingling as each printed product passes from a first high speed conveyor to a slower speed second conveyor.

The speed and efficiency of a rotary printing press is dependent in part on the delivery system following passage of a printed web from the printing press, through an in-line finishing system, if utilized, and then through a rotary cutter operative to cut or sever the printed web transversely into finished or unfinished printed products which are then conveyed to a stacking or other handling station. A common press repeat length of conventional rotary printers is 22¾ inches which is essentially the circumference of the printing plate cylinder of the press. Other press repeat lengths are also employed. When the press repeat length is a single circumference of the printing plate cylinder, it is a conventional practice to make the knife and anvil cylinders of the rotary cutter twice the diameter of the printing plate cylinder for structural strength purposes. A pair of knife blades carried 180° apart on the periphery of the knife cylinder of the rotary cutter will sever the printed web at the end of each press repeat, assuming there is no blanket or blank gap on the forward end of the press repeat length of web and that the rotational speed of the rotary cutter is in timed relation with the speed of the rotary printing press.

It is a conventional practice to accelerate movement of the severed printed products as they leave the rotary cutter so as to create a space between the trailing edge of each product and the leading edge of the next successive product leaving the rotary cutter. Conventional practice further entails conveying the severed products at the accelerated rate along a first conveyor path, generally defined by juxtaposed parallel runs of conveyor belts moving at the accelerated speed, such as a speed 10% greater than the web speed through the print or blanket cylinders, to a second conveyor path defined by at least one conveyor belt moving at a slower speed. To facilitate shingling of the printed products as they enter and are conveyed by the second conveyor toward a stacking or other handling station, it is desirable that the trailing edge of each successive product be depressed momentarily after the product enters the second conveyor and the trailing edge leaves the first conveyor so that the leading edge of the next succeeding printed product passes over the depressed trailing edge to effect shingling.

One known technique for depressing the trailing edge of each successive printed product leaving the first accelerated-movement conveyor path so as to facilitate shingling is to provide a rotary wheel or arm that is rotated in a generally vertical plane at the same rotational speed as the rotary press and on which is mounted a depressor member operative to engage and depress the trailing edge of each successive printed product as it leaves the first conveyor path and enters the slower speed second conveyor path. This technique assists in effecting shingling as long as the repeat length on the rotary press is a full repeat length or is equal to one-half of a full repeat length. In the latter case, a pair of depressors may be mounted on the carrier spaced 180° apart. Alternatively, the rotational speed of the single depressor carrier may be doubled. This, however, creates a problem in that the depressor member is now moving at a tangential velocity greater than the velocity of the printed product received from the accelerated speed conveyor. This tends to increase the surface speed of the product in

conflict with the action of the slower speed second conveyor path which is trying to slow down the speed of the product.

Another problem with prior techniques which utilize a rotary arm carrying one or two diametrically opposed depressor members for depressing the trailing edges of successive products leaving the accelerated-speed conveyor path so as to effect product shingling is that they fail to compensate for situations where the rotary press and rotary cutter are designed to produce trimmed and untrimmed printed products having variable longitudinal lengths measuring a fraction of the press repeat length other than one-half, such as one-third, one-fourth, one-fifth or two-thirds of the printing press repeat length. The latter product lengths are commonly described as resulting from "three-around", "four-around", "five-around", etc., press repeats. Further, the prior techniques for effecting shingling of printed products received from a rotary cutter fail to compensate for the transverse scrap or non-image waste strip generally produced between the press repeat length or individual finished product. As a result, where a plurality of printed products are cut from each press repeat, the point of contact between the depressor member and each successive product takes place progressively closer to the trailing edge of the product. This creates cumulative error and significantly inhibits desired shingling between successive printed products as they pass from the accelerated speed conveyor path to the slower conveyor path on the way to a stacker or other handling station.

In addition to depressing the trailing edge of each successive printed product passing from the high speed conveyor to the slower speed conveyor to effect shingling of the products disposed on the slower speed conveyor, it is highly desirable that each product be decelerated as it enters the slower conveyor so as to prevent buckling and wrinkling of the individual products. Known systems for delivering printed products in sequential fashion from a printing press effect deceleration of the products after they have entered a reduced speed belt conveyor from a higher speed belt conveyor by causing the leading edge of each product to enter a nip defined between the reduced

speed conveyor belts and at least one idler roller. Simultaneously with the leading edge entering this nip, the trailing edge of the product is pressed against the reduced speed conveyor belts by means of a knock-down arm at the upstream end of the second conveyor. A significant problem with this arrangement is that there is no provision for adjustment of the braking action applied to the products, thus failing to enable adjustment of the braking pressure applied to each printed product. Moreover, this arrangement is limited to use with sheet or printed products of equal length.

Thus, a need exists for an arrangement or mechanism which facilitates shingling of printed products being conveyed from a first relatively high speed conveyor to a reduced speed conveyor disposed downstream from a variable rotary cutter operative to cut variable length printed products from a web received from a rotary printer, each printed product being precisely engaged at its trailing edge in timed relation to entering the reduced speed conveyor so as to depress the trailing edge and effect engagement with a stationary brake pad to both decelerate the product and facilitate shingling of printed products carried by the reduced speed conveyor.

Summary of the Invention

One of the primary objects of the present invention is to provide a novel mechanism for effecting improved shingling of printed products conveyed from a variable rotary cutter disposed downstream from a rotary printing press.

A more particular object of the invention is to provide a novel mechanism for depressing the trailing edges of successive printed products as they pass from an accelerated-speed conveyor to a slower speed conveyor so as to facilitate shingling of the sheet products, the mechanism being operative to engage the trailing edge of each successive printed product at substantially the same location notwithstanding that an irregular gap occurs periodically between successive products.

A further object of the present invention is to provide a novel mechanism for momentarily depressing the trailing edges

of successive printed products as they pass from a relatively high speed conveyor to a slower speed conveyor downstream from a rotary cutter so as to facilitate shingling of the products, the mechanism including depressors carried on at least one rotary wheel for cooperation with a brake pad to both depress the trailing edge of each printed product and effect deceleration thereof.

Still another object of the present invention is to provide a novel arrangement for decelerating printed products as they are conveyed from a variable rotary cutter through a relatively high speed conveyor to a slower speed conveyor so that the printed products are shingled as they are conveyed by the slower speed conveyor, the arrangement including a plurality of depressor or kicker members carried on a rotating carrier or wheel and operative to accurately engage and depress the trailing edge of each successive printed product as it passes from the high speed conveyor to the slower speed conveyor, and a brake pad cooperative with the depressor members to decelerate each product simultaneously with depressing its trailing edge, the brake pad being adjustable during movement of the products so as to selectively vary the frictional decelerating forces applied to the products and thereby vary the extent of deceleration.

A feature of the present invention lies in the provision of a rotatable depressor or kicker wheel having a plurality of depressor or kicker members carried about its periphery, the depressor members being selectively adjustable about the depressor wheel to enable angular phasing with the positions of the knife blades carried on the variable rotary cutter and being coordinated with the repeat pattern of the rotary printing press so as to accurately engage and depress the trailing edge of each successive printed product into cooperation with a brake pad to selectively decelerate the products and facilitate shingling of the printed products irrespective of the removal of dissimilar size transverse scrap or non-image waste strip between individual products.

Another feature of the invention lies in the utilization of brush bristles as the depressor or kicker members

carried about the depressor wheel, the brush bristles being operative to momentarily depress the trailing edge of each successive printed product against the friction pad without adversely affecting the upper printed surfaces of the products.

In carrying out the present invention, an arrangement is provided for decelerating successive printed products as they are conveyed from a variable rotary cutter by a high-speed belt conveyor to a slower speed belt conveyor, the products having been cut to equal lengths by the rotary cutter after receipt from a rotary web printing press. The variable rotary cutter carries a plurality of knife blades which are adjustable about the periphery of the cutter cylinder so as to cut the printed web to remove any blanket gap from the lead end of the press repeat and then butt cut the web transversely to create a member of equal length printed products as established by the print cylinder during each revolution or press repeat. Alternatively, the knife blades on the cutter cylinder may be positioned to trim any blanket gap created in a given press repeat length of printed web, and to cut out any bleed trim between the resulting equal length printed products within the given press repeat length of web. As a result of the blanket gaps cut from each press repeat length of web, the equal length printed products conveyed by the high speed belt conveyor to the lower speed belt conveyor will have unequal spacing between the last product of each press repeat and the first product of the next press repeat.

The decelerating arrangement of the present invention compensates for any unequal spacing between successive printed products conveyed from the high speed conveyor by providing at least one depressor or kicker wheel rotatable in a substantially vertical plane at the entry end of the slower speed conveyor. The depressor or kicker wheel carries a plurality of depressor or kicker members in the form of generally radial bristle brushes which have outer ends lying on a circle concentric with the axis of rotation of the wheel and having a diameter substantially equal to the outer diameter of the printing plate cylinder. The depressor members are disposed about the kicker wheel in angular circumferential positions corresponding to the angular

circumferential positions of the cutting knives on the rotary cutter which create the trailing edge of each successive printed product formed by the rotary cutter.

When a printed product passes from the high-speed belt conveyor immediately downstream of the rotary cutter into the slower speed belt conveyor, the leading edge of the printed product enters a nip defined between one or more transversely aligned headstop idler rollers and the slower moving belt of the second conveyor. This nip operates to immediately reduce the speed of the entering printed product and is positioned downstream from the depressor wheel so that the trailing edge of the product now underlies and is engaged and depressed by the next depressor brush on the rotating depressor wheel. Because the speed of each print product leaving the high speed belt conveyor is substantially the same, the only variable affecting the timing of entry of the printed products into the slower belt conveyor headstop nip is the spacing between successive products passing downstream from the high speed conveyor, as caused by removal of the blanket gap from each press repeat length of printed web. By spacing the depressor or kicker brushes about the depressor or kicker wheel in corresponding angular relation to the knife blades on the rotary cutter which established the trailing edges of successive printed products, the specific depressor or kicker brush on the depressor wheel which corresponds to the last-to-cut knife blade on the rotary cutter will momentarily engage and depress the trailing edge of printed product which has just entered the slower belt conveyor so as to enable the leading edge of the next succeeding printed product to pass over the depressed trailing edge and effect shingling between successive products.

In order to further decelerate forward movement of each printed product entering the slower belt conveyor, a stationary brake pad is supported slightly below the path traversed by the products passing from the high speed conveyor to the slower speed conveyor and also generally vertically below the rotational axis of the depressor wheel. The brake pad is vertically adjustable so as to cooperate with the depressor or kicker brushes to

sandwich the momentarily depressed trailing ends of the printed products between the brushes and the brake pad with sufficient frictional pressure to decelerate the corresponding printed product close to the surface speed of the slower belt conveyor. In this manner, successive printed products are caused to shingle and decelerate irrespective of unequal spacing between the conveyed printed products due to removal of dissimilar size transverse scrap or blanket gaps or non-image waste strips between individual printed products.

Further objects, features and advantages of the invention, together with the organization and manner of operation thereof, will become apparent from the following detailed description of the invention taken in conjunction with the accompanying drawings wherein like reference numerals designate like elements throughout the several views.

Brief Description of the Drawings

FIG. 1 is a perspective view of a variable rotary cutter and associated printed product delivery arrangement in accordance with the present invention;

FIG. 2 is a side elevational view of the product delivery arrangement of FIG. 1, the near side frame wall being removed and portions broken away for clarity and the rotary cutter being schematically illustrated in phantom;

FIG. 3 is a side view, on an enlarged scale, of a depressor or kicker wheel as employed in the product delivery arrangement of FIG. 2;

FIG. 4 is a side edge view of the kicker wheel illustrated in FIG. 3, taken along lines 4-4 of FIG. 3;

FIG. 5 is a fragmentary sectional view illustrating the manner of mounting the depressor or kicker brushes on the kicker wheel of FIG. 3;

FIG. 6 is a laterally foreshortened generally vertical sectional view illustrating the manner of supporting the adjustable brake pad illustrated in FIG. 2;

FIG. 7 is a fragmentary detail view taken substantially along line 7-7 of FIG. 6 illustrating the brake pad and associated support linkage;

FIG. 8 is a fragmentary side elevational view taken substantially along line 8-8 of FIG. 6 illustrating the adjustment mechanism for the brake pad;

FIG. 9 is a schematic plan view of a length of printed web showing in dash lines the transverse cuts made by the rotary cutter between individual products after leaving the printing press, and comparing the manner of also showing the points of contact with the depressor wheel of the subject invention as compared to points of contact mace with knock-down arms as used in prior printed product delivery systems;

FIG. 10 is a schematic diagram illustrating the relative sequence positions of printing cylinders, rotary cutter, and rotary kicker wheel/brake pad arrangement operative to print, cut and shingle printed products in accordance with the present invention.

Detailed Description

Referring now to the drawings, and in particular to FIG. 1, a printed product delivery system or arrangement for decelerating and shingling printed products in accordance with the present invention is indicated generally at 10. The delivery system or arrangement 10 serves to decelerate and effect shingling of printed products received from a variable rotary cutter, indicated generally at 12, as the products are conveyed from a high speed belt conveyor to a slower speed belt conveyor, as will be described. The variable rotary cutter 12 is preferably of known computer controlled design, such as commercially available from Scheffer, Inc., Merrillville, IN, and includes a rotary knife cylinder 14 and a parallel anvil cylinder 16 which are operative to rotate in timed relation in a known manner. The knife cylinder 14 is adapted to carry a plurality of knife or cutter blade assemblies, one of which is indicated at 18, about the periphery or circumference of the knife cylinder so that the knife blade assemblies cooperate with the anvil

cylinder to cut or sever a continuous web of paper received from a rotary printing press, as schematically illustrated at 20 in FIG. 10. As schematically illustrated in FIG. 10, the printing press 20 typically includes upper and lower printing plate cylinders 22a and 22b which determine the press repeat length, and a pair of upper and lower blanket cylinders 24a and 24b which print on both sides of a continuous web of paper or the like, indicated at 26 in FIG. 9, passed through the nip defined between the blanket cylinders.

The knife cylinder 14 and anvil cylinder 16 of the variable rotary cutter 12 define a nip therebetween which receives the printed web from the rotary printer 20 so as to sever a repeat length of the web into a plurality of substantially equal length printed products, indicated at 26a-e in FIG. 9, separated by transverse butt cuts indicated by dash lines 28. In printing a continuous web with a rotary press, a transverse scrap or blanket gap will frequently be formed at the forward or rearward end of the web, such as indicated at 30 at the forward end of each press repeat length of web 26. The rotary cutter is operative to remove the blanket gaps as by effecting a transverse cut 32 which defines the leading edge of the first printed product in a press repeat length of web coming from the printer.

As is known, a length of printed web coming from a rotary printer may also have non-image waste strips formed between the individual equal length printed products, such as 26a-e. In this situation, the rotary cutter blades are positioned so as to remove the transverse non-image waste strips between the individual printed products as they are severed and conveyed downstream from the rotary cutter. If desired, the printed web may be passed through an in-line finishing system (not shown) prior to passing through the rotary printer 12. The knife cylinder 14 is illustrated schematically in FIG. 10 as having a diameter twice the diameter of the printing plate cylinders 22a and 22b so that each 180° circumference of the knife cylinder has a similar arrangement of knife cutters to transversely cut or sever a press repeat length of the printed

web. Alternatively, the printing plate cylinders 22a and 22b may be made of a diameter equal to the diameter of the knife cylinder 14 in which event the cutter knives carried about the knife cylinder would be circumferentially spaced to remove the blanket gaps 30 and form substantially equal length printed products along each press repeat length of web by transverse butt cuts 28 or cuts sufficient to remove non-image waste strips between successive printed products. As illustrated in FIG. 1, the rotary cutter 12 includes a pair of pin wheels 36a and 36b which are rotatable in timed relation to the anvil cylinder 16 and are operative to remove chips or waste strips removed from the cutter cylinder 14 by radial pins disposed about the anvil cylinder.

Referring again to FIG. 1, the printed product delivery system or arrangement 10 includes a pair of side frames or plates 40a and 40b which are secured in upstanding laterally spaced relation by cross frame members (not shown). The side frame plates 40a and 40b have rollers 42 mounted at their lower edges to facilitate movement in a pair of tracks 44a and 44b disposed transverse to a vertical plane containing the rotational axes of the knife and anvil cylinders 14 and 16 and enabling movement of the product delivery system into close proximity to the rotary cutter or to a position spaced from the rotary cutter to facilitate service or adjustment of the various components of the rotary cutter as well providing access to a forward end of the product delivery system. A control panel 46 is mounted on the side frame 40a to facilitate operator control of various functions of the product delivery system.

Referring to FIG. 2, the product delivery system 10 has a first relatively high speed belt conveyor, indicated generally at 50, mounted between the side frame plates 40a and 40b such that the high speed conveyor defines an entry nip 52 which is configured and at a height adapted to receive printed products, such as 26a-e, etc., from the rotary cutter 12. The high speed belt conveyor 50 includes a plurality of laterally spaced lower endless belts 54 each of which is reeved about and supported by a plurality of idler rollers including a pair of horizontally aligned rollers 56a and 56b which establish a reach 54a extending

horizontally rearwardly or downstream from the receiving nip 52. Each conveyor belt 54 is also reeved about an idler pulley 58 which is adjustable to selectively adjust the tension in the conveyor belt with respect to a drive pulley 60 controlled by a suitable drive motor.

The high speed belt conveyor 50 also includes a plurality of upper endless belts 64 equal in number to the lower belts 54 and which are reeved about suitable idler pulleys 66a and 66b to define a horizontal reach 64a which overlies the reach 54a of a lower conveyor belt so as to cooperate therewith to convey printed products from the rotary cutter through the horizontal path defined between reaches 54a and 64a at an accelerated speed. For example, the surface speed imparted to each printed product by the rotary cutter 12 may approach approximately 1,000 fpm which is then accelerated by the high speed conveyor 50 to a surface speed of approximately 1,100 fpm to 1,200 fpm or higher.

The product delivery system 10 also includes a slower speed belt conveyor, indicated generally at 70, which is supported between the upstanding side frames 40a and 40b and is operative to receive printed products from the high speed conveyor 50. The belt conveyor 70 includes one or more conveyor belts 72 which preferably conform in number to the high speed conveyor belts 54. Each of the slower speed conveyor belts 72 is reeved about a forward idler pulley 74 and a rearward drive pulley 76 so as to define a horizontal reach 72a parallel to and spaced below the rearward end of the horizontal reach 64a of the upper conveyor belts 64 a distance greater than the thickness of the printed products being conveyed through the product delivery system 10. The idler rollers 74, drive rollers 74 and tension adjustment rollers 78 for the belts 72 are preferably mounted on a carriage 80 which is pivotal about the axis of the drive motor 76 by means of a control linkage 82 actuated by a solenoid or double acting cylinder 84 which enable the horizontal conveyor reach 72a to be moved downwardly to clear any paper jams or the like.

The drive pulleys 76 are driven by a drive motor or other suitable drive means so as to establish a surface speed of approximately 300 fpm along the horizontal reach 72a of the conveyor belts 72. With the high speed belt conveyor 50 and slower speed belt conveyor 70 being supported as aforedescribed, each printed product received by the high speed conveyor from the rotary cutter 12 will have its surface speed accelerated as the printed product is conveyed by the high speed conveyor belts 54 and 64. As each successive printed product exits from the exit end of the lower high speed conveyor belts 54, as established by the idler rollers 56b, it will traverse the gap between the downstream idler rollers 56b of the high speed belt conveyor and the upstream idler rollers 74 of the slower speed belt conveyor and pass onto the horizontal reach of the slower speed conveyor belts 72.

In order to reduce the surface speed of each printed product entering the slower speed belt conveyor from the higher speed belt conveyor, at least one, and preferably two or more axially aligned headstop idler rollers 88 are supported on a transverse support shaft or axle 90 which in turn is supported on the outer ends of one or more pivot arms 92 having their upper ends pivotally mounted on a transverse support shaft 94. The pivot arms 92 and headstop rollers 88 are supported on a horizontal track 96 in a manner to enable horizontal adjustment of the headstop rollers 88 relative to the upstream idler rollers 74 of the slower speed conveyor 70. The headstop rollers 88 are urged by gravity against the upper surfaces of the horizontal belt reaches 72a of the slower speed belt conveyor 70 and define a nip therewith so that the leading edge of each successive printed product will enter the nip and undergo immediate deceleration.

The headstop rollers 88 are spaced from the upstream idler rollers 74 of the slower belt conveyor 70 a distance slightly less than the longitudinal length of the printed products being cut from the printed web so that as the leading edge of each successive printed product enters the headstop nip,

its trailing edge will overlie the gap between the high speed and low speed belt conveyors 50 and 70.

In accordance with one feature of the present invention, at least one and preferably a pair of axially aligned depressor or kicker wheels, one of which is indicated generally at 100 in FIG. 2, are mounted between the upstanding frame plates 40a and 40b for rotation about a transverse rotational axis which overlies the gap between the high speed and low speed conveyors. Referring to FIGS. 3-5, taken with FIG. 2, each of the depressor or kicker wheels 100 includes a generally circular wheel plate 102 having a circular center opening 102a and to which is coaxially connected a mounting hub 104 to facilitate mounting of the depressor or kicker wheels on a transverse rotatably driven axle 107 journaled between the upstanding frame plates 40a and 40b. The axle 107 is connected to a suitable drive motor (not shown) to effect rotation of the kicker wheels 100 in a counterclockwise direction, as viewed in FIG. 2. Each kicker wheel carries a plurality of depressor or kicker members 106 which correspond in number to the number of cutter blade spaced about the cutter cylinder 14 that establish the trailing edges of the printed products formed from the printed web. In the illustrated embodiment, each of the depressor or kicker members 106 has a base 106a which may be made of a suitable plastic material and which has a generally arcuate side profile so as to seat on an annular rim surface 102b formed on the wheel 102 concentric to its center axis. The kicker members 106 may be secured in selected circumferential position about the axis of the kicker wheel by an annular retaining ring 108 which is releasably attached to the wheel plate by fasteners 110 as illustrated in FIG. 5. The base 106a of each kicker member 106 has a plurality of brush bristles 106b secured therein such that the bristles extend generally radially outwardly from the rotational axis of the kicker wheel and have outer ends lying in a circle concentric to the rotational axis of the kicker wheel and having a diameter substantially equal to the diameter of the printing plate cylinder with which the rotary cutter 14 and delivery system 10 are used.

The kicker wheels 100 are positioned to overlie the gap between the high speed and low speed belt conveyors 50 and 70 so that as the kicker wheels rotate, the outer end of each depressor or kicker member 106 will momentarily depress the trailing edge of a printed product whose leading edge has entered the headstop nip, thereby enabling the leading edge of the next successive printed product to pass over the depressed trailing end and shingle therewith.

As aforedescribed, the depressor or kicker members 106 are spaced circumferentially about the kicker wheel plate 102 so as to angularly correspond to each of the cutter blades on the cutter cylinder 14 which create a trailing edge on a printed product formed from the printed web. The rotational speed and angular position of each of the depressor or kicker members 106 is in circumferential registry with the corresponding cutter knives on the knife cylinder 14 by means of a conventional harmonic drive or differential gear box, as is known. The registry or phasing may be adjusted by an operator to obtain desired timing in depressing the trailing edge of each successive printed product along with timing of entry of the leading edge onto the headstop nip and adjustment of the surface speed of the conveyor belts 72.

In accordance with another feature of the present invention, a brake pad, indicated generally at 114, is supported slightly beneath the path traversed by the printed products as they traverse the gap into the slower speed conveyor 70. The brake pad 114 is positioned to generally vertically underlie the rotational axis of the depressor or kicker wheels 100 and is adjustable to cooperate with each of the depressor or kicker members 106 as it depresses the trailing edge of a printed product so as to sandwich the trailing edge between the kicker member and the brake pad and apply a frictional deceleration to the corresponding printed product. This additional deceleration momentarily imparted to the forwardly moving printed product a its forward edge enters the headstop nip substantially increases the rate of deceleration slowing the printed product down to the substantially slower surface speed of the slower speed conveyor

belts 72, thereby preventing or inhibiting wrinkling or other damage to the printed products.

Referring to FIGS. 6-8, taken in conjunction with FIG. 2, the brake pad 114 is supported in transverse relation to the conveyor path defined by the high and low speed conveyors 50 and 70, respectively, and extends laterally between the upstanding side frame plates 40a and 40b so as to underlie the laterally spaced kicker wheels 100. As illustrated in FIG. 6, the brake pad 114 is supported on the upper surface of a laterally extending support bar 116 which has its opposite ends fixed to slide plates 118a and 118b, both of which are mounted on the inner surfaces of the respective side plates 40a and 40b so as to enable generally vertical movement of the slide plates and thereby the brake pad 114. Each of the slide plates 118a and 118b is pivotally secured to the upper end of a pivot link 120 having its lower end pivotally connected to a rocker arm 122 which in turn is mounted on a transverse pivot shaft 124 extending between and rotatably supported by the upstanding frame plates 40a and 40b. In the illustrated embodiment, the end of the pivot shaft adjacent the side frame 40a extends through the side plate and has a gear 126 mounted in fixed relation thereon. The gear 126 is in meshing relation with a worm gear 128 which is mounted coaxially on a control shaft 130. The shaft 130 is supported by a bracket 132 fixed to the outer surface of the side frame 40a so as to allow rotation of the shaft 130, and thereby the worm gear 128, about its longitudinal axis by means of a handle 134, as illustrated in FIG. 8.

With the brake pad 114 supported for substantially vertical adjustment relative to the outer circular path traversed by the outer ends of the kicker members 106, it will be appreciated that the brake pad may be adjusted to vary the frictional relation between the successive kicker members 106 and the trailing edges of the printed products as their trailing edges are depressed, thereby facilitate shingling and also decelerating the products more quickly to the slower surface speed of the conveyor belts 72.

As aforedescribed, the knife or cutter blades carried by the knife cylinder 14 are adjustable about the periphery of the cutter cylinder so as to cut the printed web 26 to remove any blanket gap, such as indicated at 30 in FIG. 10, from the lead end of the press repeat length of the web, and then butt cut the web transversely, such as at 28, to create a number of equal length printed products as established by the print cylinders 22a and 22b during each revolution or press repeat. Alternatively, the knife blades on the cutter cylinder may be positioned to trim any blanket gap created in a given press repeat length of printed web and to cut out any bleed trim between the resulting equal length printed products within the given press repeat length of web. As a result of removing the blanket gaps from a press repeat length of web, the printed products cut from the printed web will be equally spaced as they leave the knife cylinder except for the spacing between the trailing edge of the last printed product of a press repeat length of web and the leading edge of first printed product of the next repeat length of web. The decelerating arrangement established by the depressor or kicker wheels 100 and brake pad 114 of the present invention compensates for any uneven spacing between successive printed products conveyed from the high speed conveyor 50 to the slower speed conveyor 70 by spacing the depressor or kicker members about the kicker wheel in angularly positions corresponding to the knife blades on the knife cylinder which establish the trailing edges of each successive printed products formed from the printed web.

By spacing the depressor or kicker brushes 106 about the circumference of the kicker wheels 100 in corresponding angular relation to the knife blades on the rotary cutter which establish the trailing edges of successive printed products, the depressor or kicker brush on the depressor wheel which corresponds to the last-to-cut knife blade on the rotary cutter will momentarily engage and depress the trailing edge of the corresponding printed product as its leading edge enters the headstop nip of the slower belt conveyor to enable the leading edge of the next succeeding printed product to pass over the

depressed trailing edge and effect shingling. Simultaneously this kicker brush will cooperate with the brake pad 114 to decelerate the corresponding printed product to a speed close to the surface speed of the conveyor belts of the slower belt conveyor. In this manner, successive printed products are caused to shingle and decelerate irrespective of unequal spacing between the conveyed printed products due to removal of dissimilar size transverse scrap or blanket gaps or non-image waste strips between individual printed products.

While a preferred embodiment of the present invention has been illustrated and described, it will be understood to those skilled in the art that changes and modifications may be made therein without departing from the invention in its broader aspects. Various features of the invention are defined in the following claims.

What is claimed is:

1. A method of shingling successive products cut from a longitudinally moving substantially continuous web of the product so as to create, within a given longitudinal length of the web, a plurality of products having longitudinal lengths which cumulatively add up to less than the given longitudinal length of web, and wherein the successive products are conveyed in spaced relation along a first path at a first longitudinal speed and thereafter conveyed along a second path at a second longitudinal speed less than the first longitudinal speed, said method comprising the steps of:

depressing the trailing edge of each successive product after it leaves said first path so as to enable the leading edge of the next successive product to pass above the depressed trailing edge, and

substantially simultaneously engaging the depressed trailing edge of each successive product with a brake pad so as to decelerate each product as it enters the second path.

2. The method of claim 1 wherein the products are cut from the web by a rotary cutter having a plurality of cutter blades disposed in circumferentially spaced relation about an axis of rotation of the rotary cutter, said step of depressing the trailing edge of each successive product comprising engaging the trailing edge with a discrete depressor member carried on a wheel rotatable about an axis parallel to the rotational axis of the rotary cutter, said wheel carrying a plurality of depressor members spaced about the wheel in circumferentially spaced relation equal to the circumferential spacing of selected ones of the cutter blades on the rotary cutter, and said wheel being rotated so that each depressor member will actively engage and depress the trailing edge of a product cut by a cutter blade carried on the rotary cutter at the same angular position as the active depressor member.

3. The method of claim 2 wherein said step of engaging the depressed trailing edge of each successive product comprises positioning a brake pad at a position wherein each depressed trailing edge will be engaged by the brake pad to frictionally decelerate the product.

4. The method of claim 3 wherein said depressor members comprise brushes carried by said wheel in circumferential spaced relation about said wheel, each said brush having generally radially directed bristles operative to engage the upper surface of the trailing edge of a product entering said second path so as to depress the trailing edge against the brake pad.

5. The method of claim 4 wherein said cutter blades on said rotary cutter have outer cutting edges lying on a first circle concentric to the axis of rotation of said rotary cutter, said brushes having outer tips lying on a second circle having a diameter substantially equal to the diameter of the printing plate cylinder.

6. The method of claim 4 wherein said brake pad is adjustable to vary the frictional braking relation applied to each successive sheet as its trailing edge is depressed against the brake pad to effect deceleration of the product.

Abstract of the Disclosure

An arrangement for decelerating an shingling printed products as they are conveyed from a variable rotary cutter by a high-speed belt conveyor to a slower speed belt conveyor includes at least one depressor wheel at the entry end of the slower speed conveyor. The depressor wheel carries a plurality of depressor members in circumferential positions corresponding to the circumferential positions of cutting knives on the rotary cutter. The leading edge of each printed product entering the slow speed conveyor enters a headstop nip which reduces the speed of the entering product while its trailing edge is simultaneously momentarily depressed by a depressor on the rotating depressor wheel to enable shingling between successive products. A brake pad cooperates with the depressors to decelerate the printed products to a speed close to the surface speed of the slower belt conveyor. Successive printed products are thus caused to shingle and decelerate irrespective of unequal spacing between the conveyed printed products due to removal by the cutter of dissimilar size transverse blanket gaps or non-image waste strips.

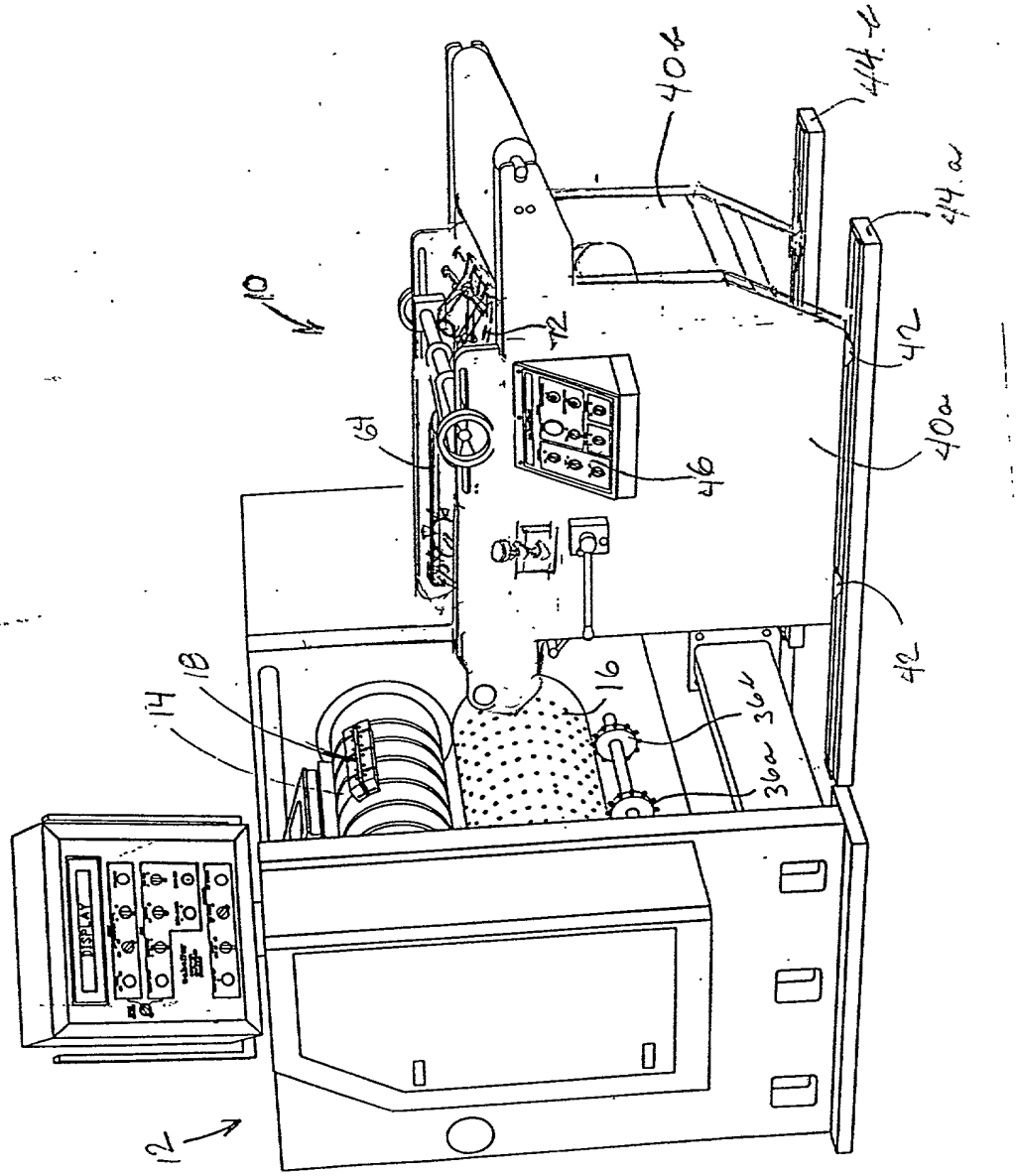
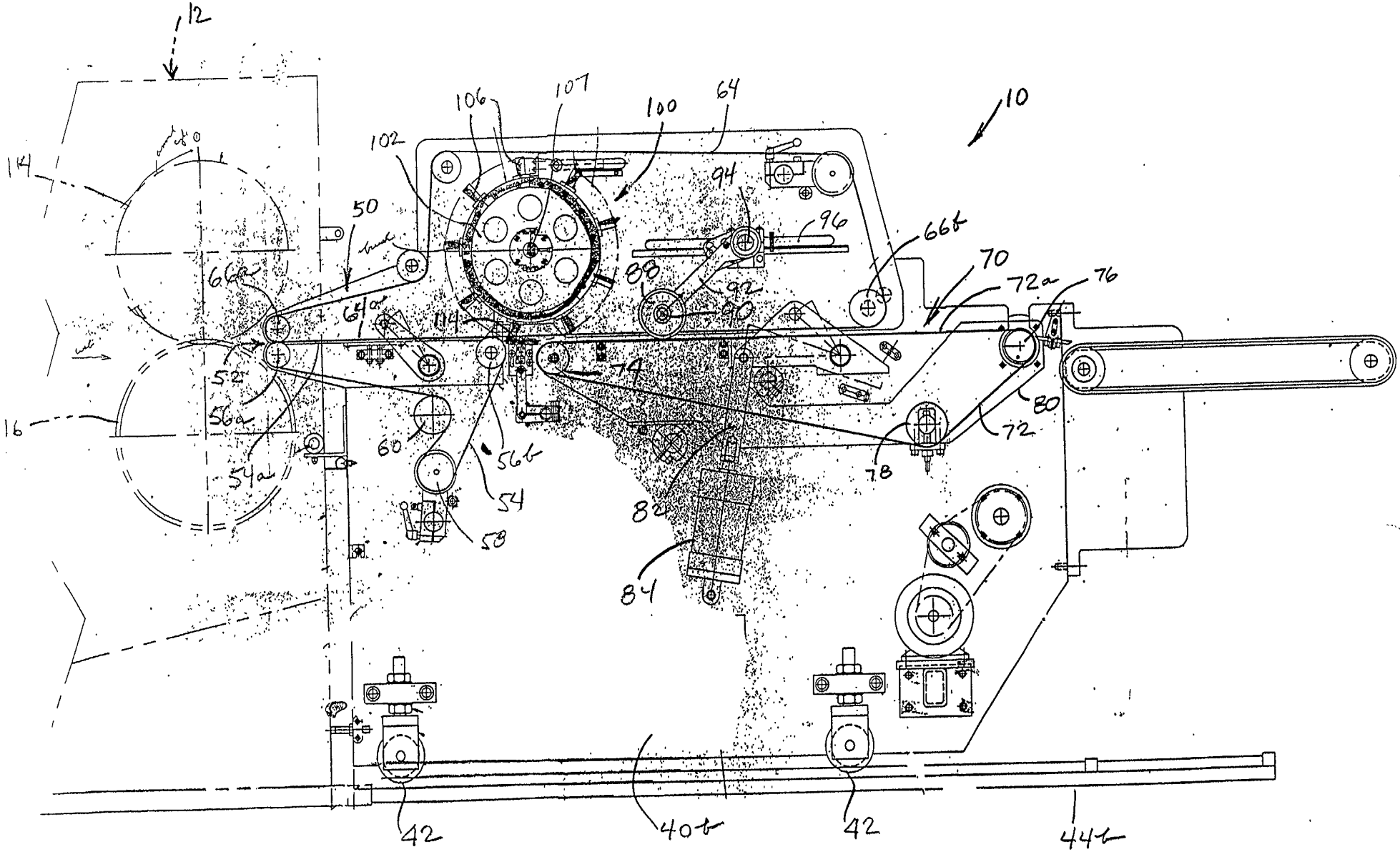


FIG. 1

FIG. 2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14
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50
52
54
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56a
56b
58
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62a
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106
107
114
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40b
42
44b

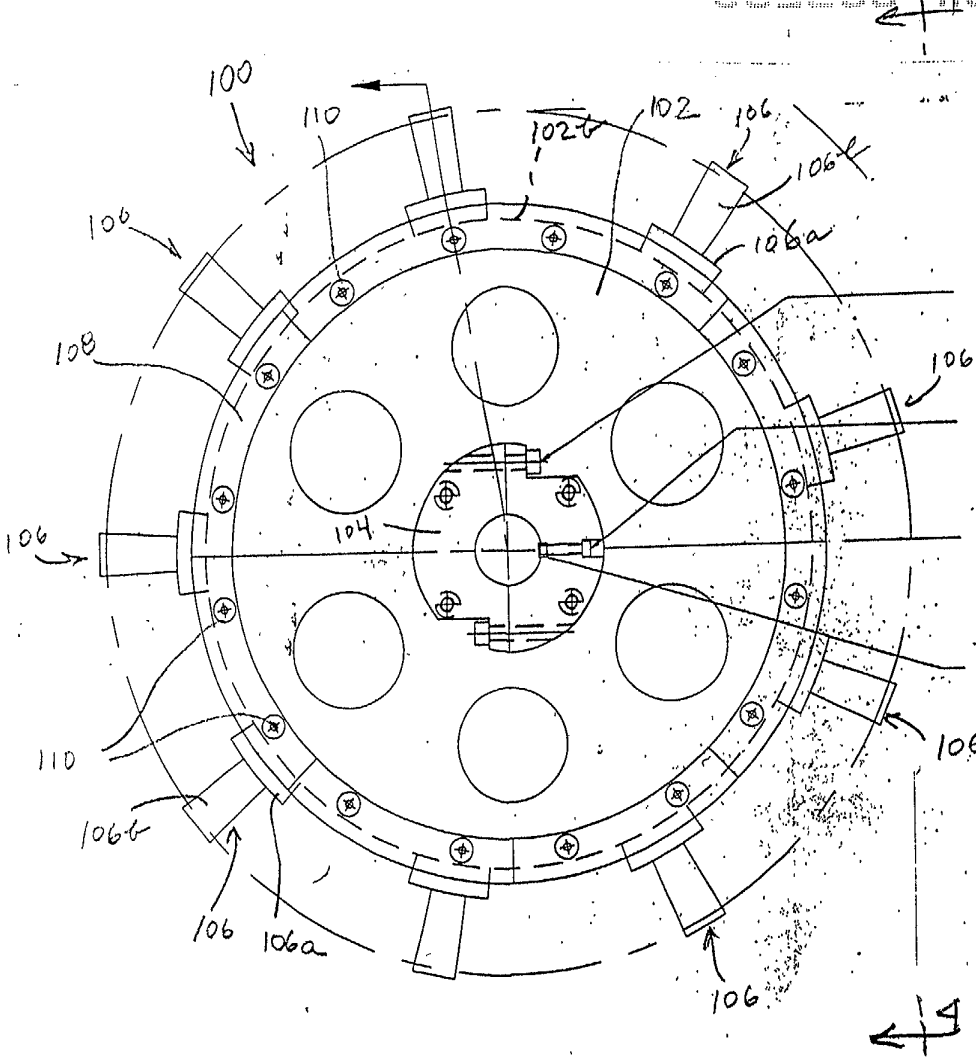

FIG. 3

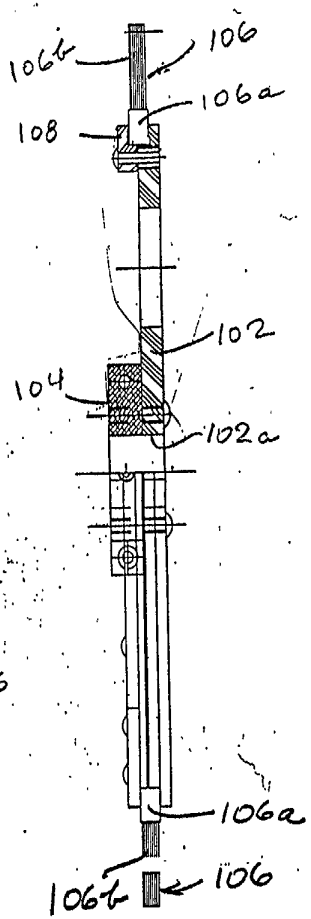

FIG. 4

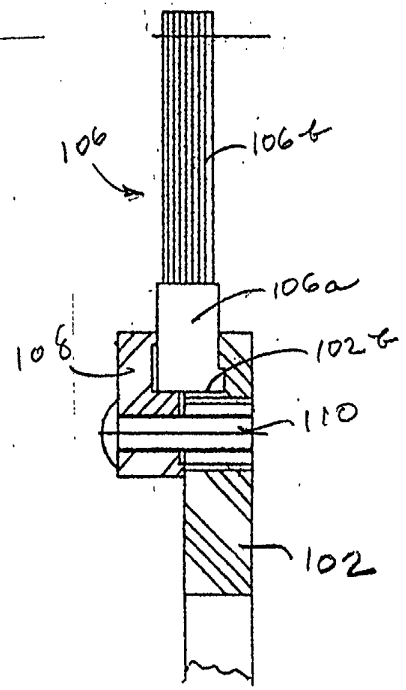

FIG. 5

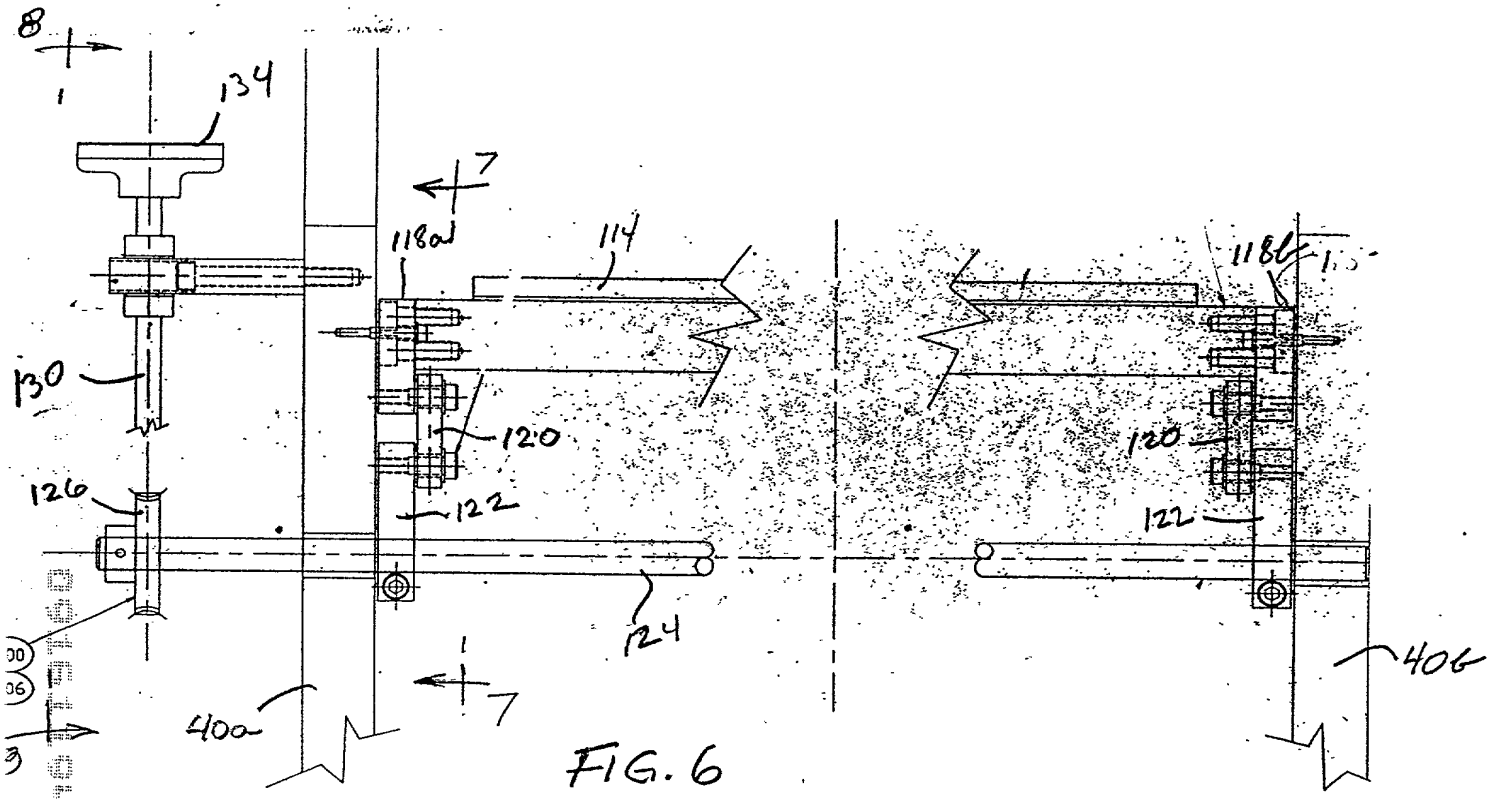

FIG. 6

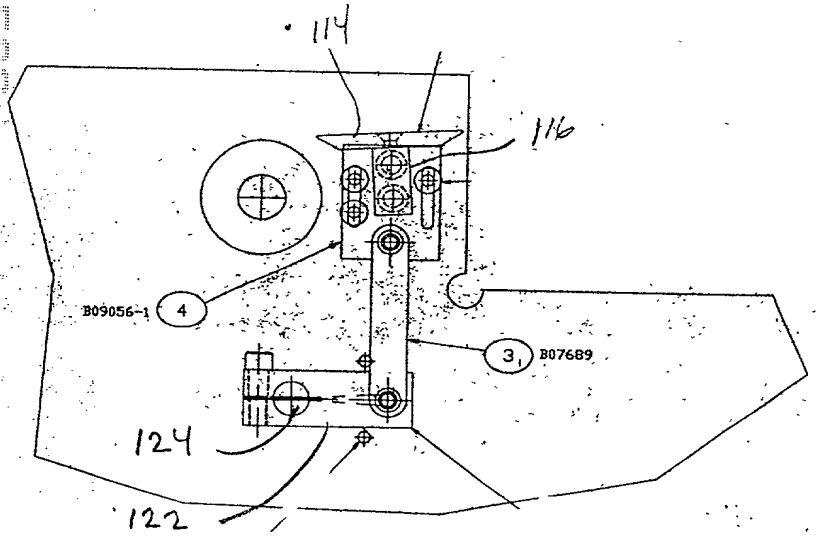

FIG 7

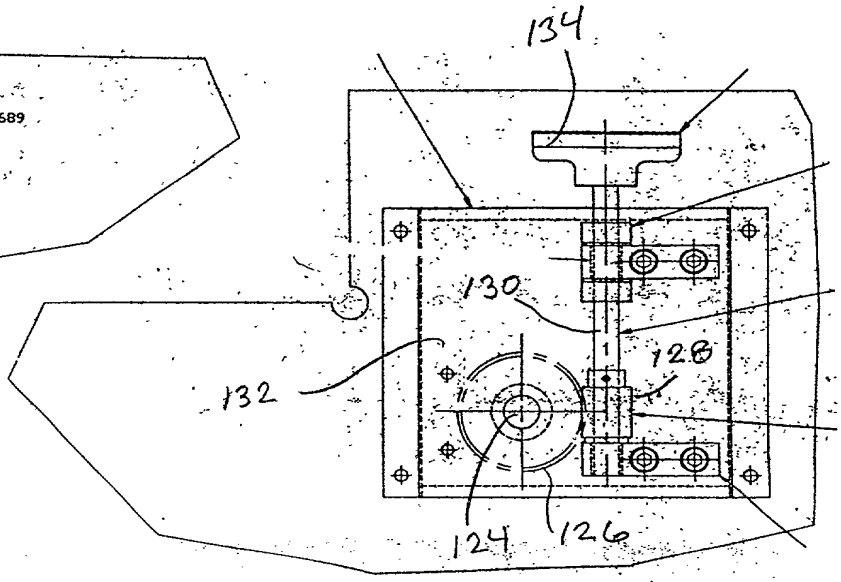

FIG. 8

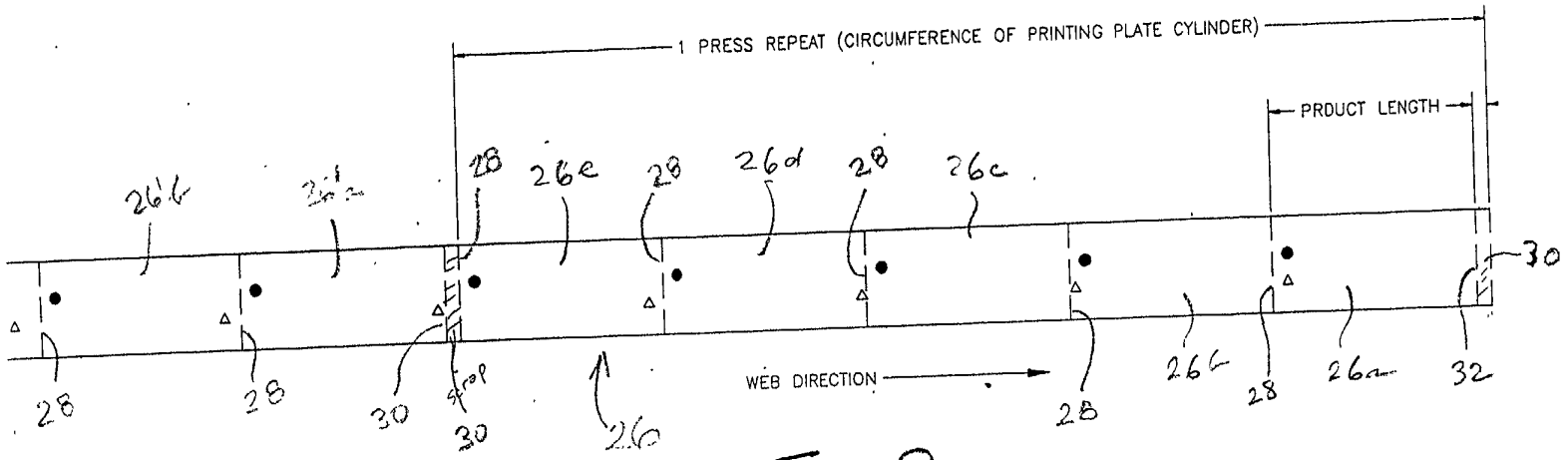
1 PRESS REPEAT (CIRCUMFERENCE OF PRINTING PLATE CYLINDER)
PRDUCT LENGTH
WEB DIRECTION
28
26e
26d
26c
26b
26a
30
32

FIG. 9

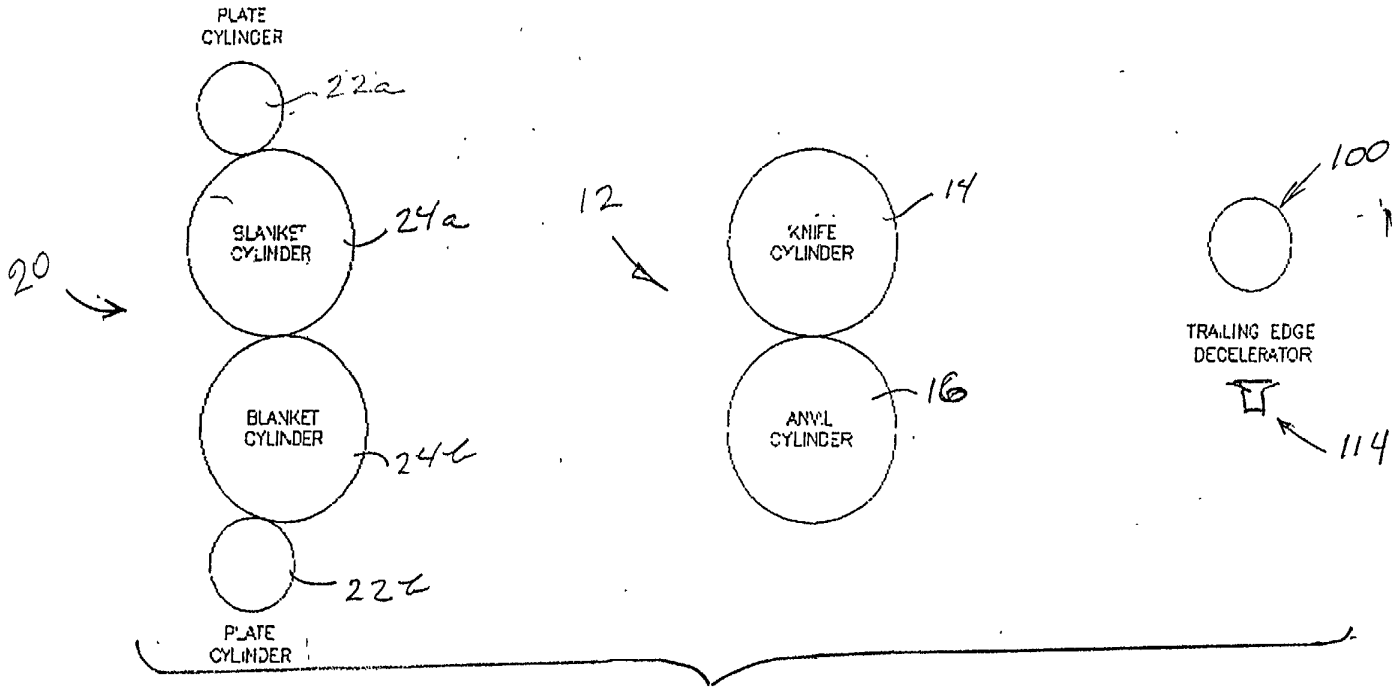
PLATE CYLINDER
22a
SLANKET CYLINDER
24a
20
BLANKET CYLINDER
24b
22b
PLATE CYLINDER
12
KNIFE CYLINDER
14
ANVIL CYLINDER
16
100
TRAILING EDGE DECELERATOR
114

FIG. 10

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare:

That my residence, post office address and citizenship are as stated below next to my name.

That I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: DECELERATING MECHANISM FOR PRINTED PRODUCTS

the specification of which (check one)

☒ is attached hereto.

☐ was filed on _____ as
Application Serial No. _____
and was amended on _____
(if applicable)

That I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

That I acknowledge the duty to disclose information known to be material to patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

That I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate on this invention having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
			☐ Yes	☐ No
(Number)	(Country)	(Day/Month/Year Filed)		
			☐ Yes	☐ No
(Number)	(Country)	(Day/Month/Year Filed)		

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

_____ _____
(Application Number) (Filing Date)

_____ _____
(Application Number) (Filing Date)

That I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

United States Application(s)

(Application Serial No.)	(Filing Date)	(Status)-(Patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status)-(Patented, pending, abandoned)

That all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

I hereby appoint the following attorneys, with full power of substitution and revocation, to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith and request that all correspondence and telephone calls in respect to this application be directed to WELSH & KATZ, LTD., 135 South LaSalle Street, Chicago, Illinois 60603, Telephone No. (312) 781-9470:

Attorney	Registration No.
Donald L. Welsh	16,665
A. Sidney Katz	24,003
Richard L. Wood	22,839
Jerold B. Schnayer	28,903
Eric C. Cohen	27,429
Joseph R. Marcus	25,060
Gerald S. Schur	22,053
Gerald T. Shekleton	27,466
James A. Scheer	29,434
Daniel R. Cherry	29,054
Howard B. Rockman	22,190
Edward P. Gamson	29,381

Full name of sole or one joint inventor: Bruce A. Scheffer

Inventor's signature: _____

Date: _____

Residence and Post Office Address: 504 Wexford Road
Valparaiso, Indiana 46383

Citizenship: United States

Address for Correspondence: WELSH & KATZ, LTD.
135 South LaSalle Street, Suite 1625
Chicago, Illinois 60603

Full name of additional joint inventor, if any: Eric K. Lo

Inventor's signature: _____

Date: _____

Residence and Post Office Address: 6328 Victory Avenue
Portage, Indiana 46368

Citizenship: United States

Full name of additional joint inventor, if any: James E. Hoolehan

Inventor's signature: _____

Date: _____

Residence and Post Office Address: 1123 MacArthur Blvd.
Munster, Indiana 46321

Citizenship: United States

Full name of additional joint inventor, if any: _____

Inventor's signature: _____

Date: _____

Residence and Post Office Address: _____

Citizenship: _____

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That I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: DECELERATING MECHANISM FOR PRINTED PRODUCTS

the specification of which (check one)

☐ is attached hereto.

☒ was filed on June 29, 1995 as
Application Serial No. 08/496,822
and was amended on _____
(if applicable)

That I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

That I acknowledge the duty to disclose information known to be material to patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

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Prior Foreign Application(s)			Priority Claimed	
			☐ Yes	☐ No
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United States Application(s)

(Application Serial No.)	(Filing Date)	(Status)-(Patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status)-(Patented, pending, abandoned)

That all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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James A. Scheer	29,434
Daniel R. Cherry	29,054
Howard B. Rockman	22,190
Edward P. Gamson	29,381

Full name of sole or one joint inventor: Bruce A. Scheffer

Inventor's signature: Bruce A Scheffer

Date: 9-11-95

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Citizenship: United States

Address for Correspondence: WELSH & KATZ, LTD.
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Chicago, Illinois 60603

Full name of additional joint inventor, if any: Eric K. Lo

Inventor's signature: Eric K. Lo

Date: 9-14-95

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Citizenship: United States

Full name of additional joint inventor, if any: James E. Hoolehan

Inventor's signature: James E. Hoolehan

Date: 9-14-95

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Inventor's signature: Thomas J. Payer

Date: 9-14-95

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